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REMARKS

This Amendment and Reply seeks to place this application in condition for allowance. The rejections raised in the Office Action of March 21, 2006 (hereinafter the "Office Action") have been addressed. Further, the claims have been amended to more fully protect certain of the instant inventions. No new matter has been added.

Office Action of March 21, 2006

In the Office Action, the Examiner again rejected the claims as being anticipated by Adams et al. U.S. Patent 5,914,553 (hereinafter, "Adams"). In doing so, it appears that certain limitations in independent claim 27 were given no patentable weight. In this regard, the Examiner stated that:

Applicant argued in the Remarks that [the] Adams resonator does not address resonance frequency variations by process-tolerance-induced fabrication errors.¹ This is a structural claim and has nothing to do with the fabrication process. (Office Action, page 3, paragraph 4).

Thus, it appears that on that basis, the Examiner maintained that Adams anticipated independent claim 27 (as well as the claims which depend therefrom) notwithstanding certain express claim limitations pertaining to the geometry of the claimed spring-mass mechanism that are clearly absent from the Adams structure.

¹ Applicants actually stated, "the Adams resonator does not address resonance frequency variations by process-tolerance-induced fabrication errors ... by employing a resonator geometry that is defined as claimed herein." (Page 10, first paragraph, emphasis added). That is, Adams does not teach the claimed resonator geometry which "is defined such that variations in the effective mechanical stiffness of the spring-mass mechanism are compensated by proportional changes in the effective mechanical mass of the spring-mass mechanism whereby one or more variations of the fabrication process to the constituent material results in little change to a ratio defined by a change in the effective mechanical stiffness and a change in the effective mechanical mass." (Claim 27).

It is respectfully submitted that the Examiner has misinterpreted the Applicants' claims as well as Applicants' remarks. Applicants have not claimed a fabrication process. Applicants have defined the geometry of the spring-mass mechanism of the resonator in an entirely acceptable manner and, as such, the geometry as described in the claims must be accorded patentable weight.

In sum, when the claims are properly interpreted and the structure of the resonator is accorded patentable weight, it is quite clear that Adams neither anticipates nor renders obvious the claimed inventions.

Independent Claim 27

Independent claim 27 describes a resonator having the following limitations:

- a spring-mass mechanism, having an effective mechanical stiffness and an effective mechanical mass defined by a geometry;
- the geometry and the effective mechanical mass of the spring-mass mechanism are simultaneously defined by application of a fabrication process to a constituent material; and
- the geometry is defined such that variations in the effective mechanical stiffness of the spring-mass mechanism are compensated by proportional changes in the effective mechanical mass of the spring-mass mechanism whereby one or more variations of the fabrication process to the constituent material results in little change to a ratio defined by a change in the effective mechanical stiffness and a change in the effective mechanical mass.

Thus, claim 27 recites, among other things, a resonator having a spring-mass mechanism. The spring-mass mechanism includes a geometry. The geometry of the

spring-mass mechanism is such that "that variations in the effective mechanical stiffness of the spring-mass mechanism are compensated by proportional changes in the effective mechanical mass of the spring-mass mechanism". In addition, the geometry of the spring-mass mechanism is further defined such that "one or more variations of the fabrication process to the constituent material results in little change to a ratio defined by a change in the effective mechanical stiffness and a change in the effective mechanical mass."

Importantly, it is the geometry of the spring-mass mechanism of the resonator that is defined. Claim 27 does not claim a resonator made according to a certain process. Moreover, claim 27 does not claim a fabrication process nor does it include limitations to one or more fabrication/manufacturing steps. Indeed, any process may be employed to fabricate Applicants' claimed resonator.

As noted in the application, the geometry of the spring-mass mechanism is such that it compensates for variations in mechanical stiffness of the spring-mass mechanism by proportional² changes in the effective mechanical mass. For example, in one embodiment,

² Regarding the concept of "proportional" and/or "proportionality", as noted in the specification at page 12, line 22 to page 13, line 9,

[a]s can be seen from equations 1 and 4 above, within the context of the working example, a process-tolerance-induced undercut will affect the width of a spring mechanism and hence its mechanical stiffness k_y , in a cubic manner while simultaneously affecting the effective mass in only the first order. . . . Other proportionality relationships will exist for other geometries, and beam-mass combinations of differing constituent material compositions. However, regardless of specific geometry and/or composition, the present invention provides, at least in one aspect, for maintenance of the following relationship:

$$\frac{\partial}{\partial uc} \left(\frac{k_y}{m} \right) = 0 \quad \text{Equation 6.}$$

the present invention identifies a solution to the problem of resonance frequency variations in discrete oscillators caused by variations in the mechanical stiffness of a spring mechanism as caused by process-tolerance-induced undercut errors. This solution properly defines the surface area of a corresponding mass in such a way that the same process-tolerance-induced undercut error removes a corresponding, and therefore compensating, portion of mass m . Effective mass is changed proportional to variations in actual width of the spring mechanism. As a result, referring again to equation 5, effective mass (m) changes in proportional accordance with variations in the mechanical stiffness (k_y) of the beam structure under the influence of a fabrication process, such that the ratio k_y/m remains constant. (Page 12, lines 12-20).

As further noted in the application, there is difficulty in realizing an exact proportionality constant between mechanical stiffness and actual mass, as well as typically occurring, yet unaccounted for variations in implementation of the fabrication process makes it difficult to maintain the ratio of Equation 6 to exactly zero. Accordingly, the inventors employ the term "little change"

to describe best reasonable efforts to maintain at near zero the ratio between the change in mechanical stiffness of the spring mechanism and the change in the actual mass of the mass element.³ (Page 13, lines 13-20).

Thus, the claimed resonator includes a spring-mass mechanism having a geometry (for example, shape, features, length, thickness and/or width), "such that variations in the

³ There are numerous ways to implement the inventive structure having a geometry whereby process-tolerance-induced variations in the mechanical stiffness of a spring mechanism are compensated by proportional changes in a corresponding effective mass to provide a zero, near zero or predetermined ratio between the changes in mechanical stiffness of the spring component and the actual mass of the mass component. (Page 13, lines 21-23).

effective mechanical stiffness of the spring-mass mechanism are compensated by proportional changes in the effective mechanical mass of the spring-mass mechanism whereby one or more variations of the fabrication process to the constituent material results in little change to a ratio defined by a change in the effective mechanical stiffness and a change in the effective mechanical mass." Applicants do not claim a process; nor do Applicants' claims include process limitations.

Claim Rejection – 35 USC §102

In the Office Action, all of the claims were rejected as being anticipated by Adams. Applicants respectfully disagree that Adams anticipates the inventions as claimed. As mentioned previously, Adams describes and illustrates a resonator that neither expressly nor inherently teaches the microelectromechanical resonator of claim 27. In this regard, Adams, among other things, does not describe a microelectromechanical resonator having a spring mass mechanism which includes a geometry which is defined such that variations in the effective mechanical stiffness of the spring-mass mechanism are compensated by proportional changes in the effective mechanical mass of the spring-mass mechanism.

In addition, the geometry of the spring mass mechanism of the Adams resonator is different from the geometry of the claimed inventions in that, unlike the geometry of the claimed resonator, one or more variations of the fabrication process to the constituent material in Adams does not result in little change to a ratio defined by a change in the effective mechanical stiffness and a change in the effective mechanical mass. Indeed, the Adams resonator does not address resonance frequency variations by process-tolerance-induced fabrication errors by employing a geometry of a spring-mass mechanism of the resonator as claimed herein.

For at least the reasons set forth below, all of the currently pending claims are neither anticipated by nor obvious to one skilled in the art in view of Adams. Notably, the reasons set forth below are *not* the only reasons the inventions of the independent claim are patentable over Adams, either alone or in combination with other art (whether such art is of record or not). As such, no inference or conclusion should be drawn that Applicants' response to this rejection is exhaustive; rather, for the sake of brevity, the remarks focus on some of the patentable aspects of the independent claim.

Adams et al. (U.S. Patent 5,914,553)

Briefly, Adams describes a microelectromechanical resonator having a plurality of lateral (moveable) electrodes 70 and 72 which are interleaved or interdigitated relative to stationary electrodes 84 and 90. The lateral electrodes 70 and 72 are secured to support beam 56 which serves as a backbone for the outwardly extending lateral electrodes. (Col. 8, line 29 to Col. 9, line 9 and Figure 9).

The Adams device employs a bias voltage between the electrodes 70 and 84 and between adjacent electrodes 72 and 90 to tune the resonant frequency of the mechanical system. (Col. 8, lines 51-61).

The Adams microelectromechanical resonator includes a plurality of vents in the electrodes/beams to facilitate release of the moveable electrodes. (Col. 8, line 64 to Col. 9, line 22 and Figures 9 and 10).

Notably, Adams does not describe a microelectromechanical resonator having a geometry which is defined such that one or more variations of the fabrication process to the constituent material results in little change to a ratio defined by a change in the effective mechanical stiffness and a change in the effective mechanical mass. Nor does

Adams describe a resonator having a geometry that is defined such that variations in the effective mechanical stiffness of the spring-mass mechanism are compensated by proportional changes in the effective mechanical mass of the spring-mass mechanism. Indeed, the Adams device tunes the resonant frequency via adjusting the voltage applied to actuators 69 and 71.

**Adams Does NOT Anticipate or Render
Obvious the Claimed Inventions**

Simply put, Adams neither anticipates nor renders obvious the claimed invention. The Adams resonator does not address resonance frequency variations by process-tolerance-induced fabrication variations – for example, process-tolerance-induced undercut variations – via implementing a resonator having a geometry whereby process-tolerance-induced variations in the mechanical stiffness of a spring mechanism are compensated by proportional changes in a corresponding effective mass to provide a zero, near zero or predetermined ratio between the change in mechanical stiffness of the spring component and the change in the actual mass of the mass component.

Adams Does NOT Anticipate the Claimed Inventions

Adams does not teach or suggest – expressly or inherently – a microelectromechanical resonator having a geometry that is defined such that variations in the effective mechanical stiffness of the spring-mass mechanism are compensated by proportional changes in the effective mechanical mass of the spring-mass mechanism whereby one or more variations of the fabrication process to the constituent material results in little change to a ratio defined by a change in the effective mechanical stiffness and a change in the effective mechanical mass.

The Adams microelectromechanical device includes a geometry having vents in the electrodes/beams to facilitate release of the moveable electrodes. (Adams, Col. 8, line 64 to Col. 9, line 22 and Figures 9 and 10). The geometry of the Adams resonator is not defined such that variations in the effective mechanical stiffness of the spring-mass mechanism are compensated by proportional changes in the effective mechanical mass of the spring-mass mechanism. Indeed, Adams employs a bias voltage between electrodes 70 and 84 and between adjacent electrodes 72 and 90 to tune the resonant frequency of the mechanical system (Adams, Col. 8, lines 51-56).

Nowhere does Adams teach or suggest – expressly or inherently – spring-mass mechanism having a geometry that is defined such that variations in the effective mechanical stiffness of the spring-mass mechanism are compensated by proportional changes in the effective mechanical mass of the spring-mass mechanism whereby one or more variations of the fabrication process to the constituent material results in little change to a ratio defined by a change in the effective mechanical stiffness and a change in the effective mechanical mass. Indeed, Adams appears to be relatively unconcerned with variations of the fabrication process to the constituent material of the resonator or with a ratio defined by a change in the effective mechanical stiffness and a change in the effective mechanical mass. In this regard, Adams employs a bias voltage between electrodes 70 and 84 and between adjacent electrodes 72 and 90 to tune the resonant frequency of the mechanical system (Adams, Col. 8, lines 51-56) irrespective of the variations of the fabrication process and its effects on the characteristics and operation of the resonator.

In sum, Adams does not anticipate the invention as claimed.

Adams Does NOT Render Obvious the Claimed Inventions

There is absolutely no suggestion or motivation to one skilled in the art to provide a resonator having a geometry that is defined as set forth in claim 27. For example, Adams does not compensate for variations in spring-mass mechanism, as the result of process-tolerance-induced errors, by altering the effective mass of a corresponding mass element in a discrete oscillator in a proportional, offsetting manner. As mentioned above, it appears that Adams employs a bias voltage between electrodes 70 and 84 and between adjacent electrodes 72 and 90 to tune the resonant frequency of the mechanical system (Adams, Col. 8, lines 51-56) irrespective of the variations of such fabrication process to the constituent material of the resonator and the resulting affects on the characteristics and operation of the resonator.

In sum, Adams, alone or in combination, does not render obvious the claimed invention.

Dependent Claims

As mentioned above, for the sake of brevity, this response does not present the additional reasons/bases that the dependent claims are patentable over Adams. Those reasons/bases are numerous. However, for at least the reasons stated above, the dependent claims are neither anticipated by nor obvious in view of Adams.

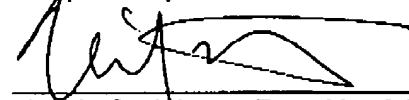
CONCLUSION

Applicants respectfully request entry of the foregoing amendments and reconsideration of the instant application. Applicants submit that all of the pending claims present patentable subject matter. Accordingly, allowance of the claims is requested.

Notably, should a telephone interview expedite the prosecution of this application in any way, the Examiner is invited to contact the undersigned at the number listed below.

Date: August 30, 2006

Respectfully submitted,



Neil A. Steinberg, Reg. No. 34,735
Telephone No. 650-968-8079